OPINION

Finding a sustainable future at the dump

By Jeffrey E. Surma

THE ECONOMIC CRISIS has now hit the bottom of the barrel — the trash barrel, that is.

If we were to look at a garbage landfill from 200 feet away, most of us would see what appears to be a landscape of unidentifiable trash. If we dared to stand in the landfill, we would be able to identify familiar solid-waste products such as paper, cardboard, metal cans, plastic and glass bottles, scrap metal, and a host of other items. But what if we were able to take a really close look — down to the atomic level? We would see trillions of molecules made up of carbon, hydrogen, and oxygen, the building blocks of precious fuel to run our cars, heat our homes, and generate electricity. We would see trillions of molecules of inorganic chemicals that could be transformed into building and construction materials to save energy and preserve our natural resources.

For years, the paradigm for waste recycling has only considered the value of waste on the material level. We recycle plastics to plastics, rubber to rubber, paper to paper — we simply refabricate the same molecules into similar products of the same molecules.

This isn't a bad idea as long as the demand for those products remains strong enough to support the cost of recycling. But we are currently witnessing a drastic drop in the market for traditional recyclables because of the downturn in our economy and the economies of global trading partners. Also, recycling and refabricating these materials often uses more energy than creating virgin products. The result — more and more recyclable materials are finding their way back into a landfill system that is getting dangerously close to capacity and continues to spew greenhouse gases.

There are a number of new technologies that can come to the rescue of this landfill dilemma.

One such technology is called plasma-enhanced melter. With it, virtually any waste product can be fed into a closed chamber where it is superheated to temperatures of between 10,000 and 20,000 degrees Fahrenheit using an electricity-conducting gas called plasma. This is not an incineration process that creates greenhouse gases, hazardous ash, and other air pollutants. The intense heat of the plasma gasification process actually rearranges the molecular structure of the waste, transforming organic (carbon-based) materials into an ultra-clean, synthetic gas (syngas) rich in carbon and hydrogen. The clean gas can be made a substitute for natural gas for heating, converted to liquid transportation fuels, or even used for electricity generation.

The gasification technology is not simply another science project. In fact, it is already being used in the United States as well as other countries. In 2003, Kawasaki Heavy Industries in Japan purchased a plasma-enhanced melter system to destroy PCBs and asbestos. Global Plasma in Taiwan has been converting industrial and medical wastes into clean electric power since 2005. Last year, Dow Corning signed a 10-year contract and construction has started to use this technology to convert chemical waste into process-quality hydrochloric acid and enough clean synthetic gas to heat several thousand homes. Fulcrum Bioenergy is building a facility outside of Reno, Nev., that will have the capacity to process 90,000 tons of municipal solid waste into 10.5 million gallons of ethanol per year. A 25-ton-per-day, demonstration-scale plasma-enhanced melter unit in Richland, Wash., is capable of processing 20 percent of the town's waste.

Plasma gasification technology like the plasma-enhanced melter creates a new paradigm for waste recycling and sustainability, because it actually rearranges the atoms in molecules of low-value waste into molecules of high-value products. Over the past 1,000 years we have called this process "alchemy." Perhaps in the next 1,000 years we will call it "a sustainable future."

Jeffrey E. Surma is president and CEO of InEnTec LLC, an Oregon-based firm specializing in the conversion of waste into clean, renewable products.

Digging up our own N. American mythology

By Ernest Hebert

IT'S A GREAT FEELING to walk in the woods and discover a stone wall, a rock-lined dug well from the 19th century, a foundation from a hill farm long since abandoned, and strange cairns perhaps built by native peoples hundreds or even thousands of years ago.

New England rocks make you feel wistful for a world you never knew, but also connected. Unlike the West, which separates you from its grandeur, New England landscape invites you to belong to it.

> So many of our place names come from ancient peoples we know very little about.

In part this intimacy comes from the invigorating climate and the land itself, which is beautiful, varied, and difficult but not appalling, but the intimacy also comes from a mysterious source that most of us don't think about but which has seeped into our psyche: the 10,000-year legacy of the aboriginal Americans that archeologists are just starting to uncover.

So many of our place names come from ancient peoples we know very little about; for example, the states of Connecticut and Massachusetts, the towns of Ossipee, Pawtucket, and Agawam; Mt. Monadnock and Mt. Katahdin; Lake Winnipesaukee and, my favorite, a lake in Webster, Mass. The abbreviated name is Lake Chaubunagungamaug, but I like the long name, Chargoggagoggmanchauggagoggchaubunagungamaugg. I wish somebody would rhyme it in a rap song.

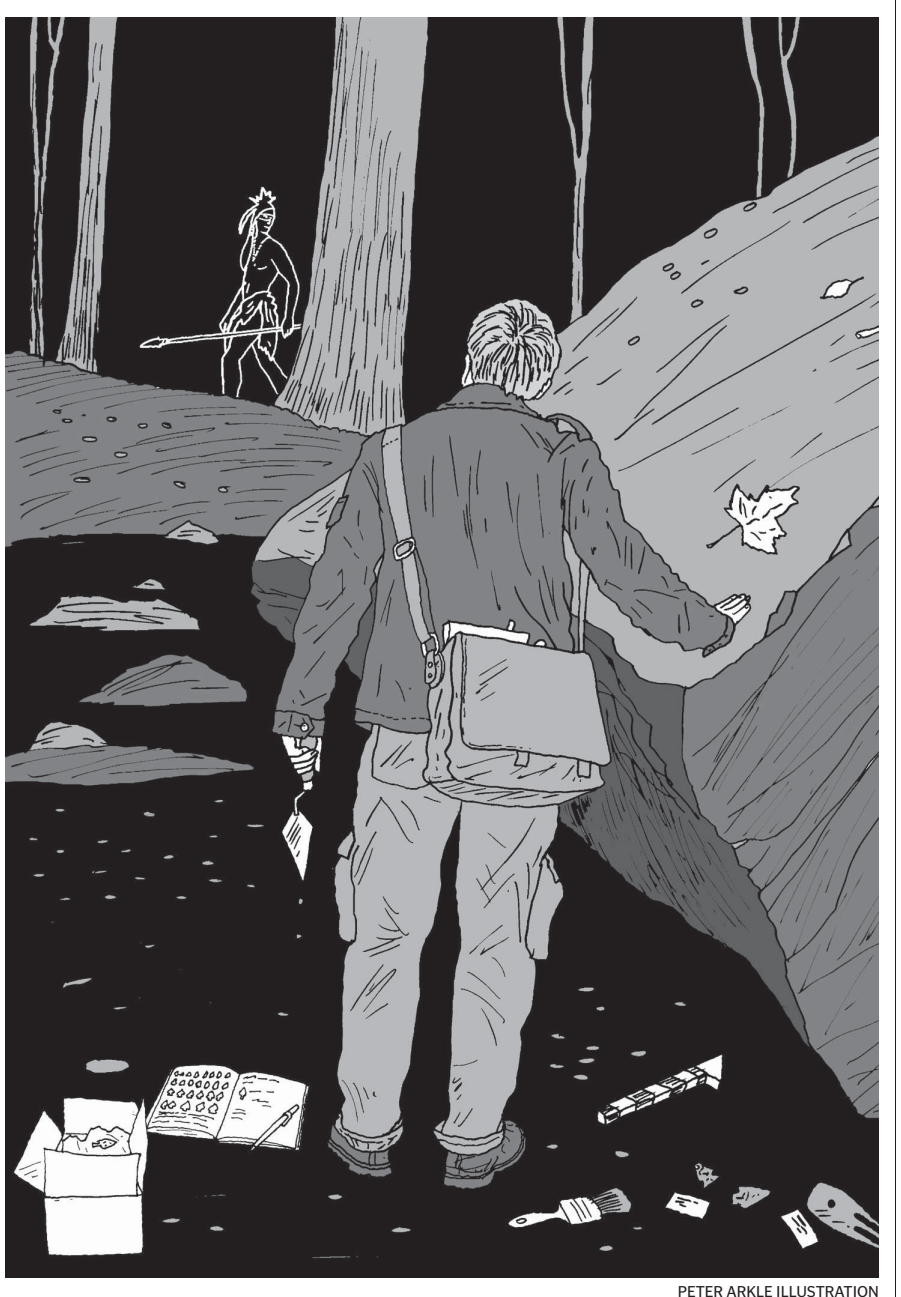
Myths and storytelling have grown up over the name of the lake. I'd like to see more myth-making centering around Native American sites, names, and ideas. So much of what we think of as American values — individual freedom, a can-do spirit, representative government — were already here among the Algonquin and Iroquois people when the Europeans arrived. The Colonists absorbed these values through cultural osmosis over the course of two centuries, transported them to Europe and eventually to the world over. The Indians never got the credit, but their stamp is on American culture. For more about this idea, read "Forgotten Founders" by Bruce E. Johansen.

Today, archeologists are digging up the past of human habitation in all six New England states. Archeological teams have found artifacts along the shores of Lake Champlain that link up with similar artifacts in northern Labrador. The artifacts along with other evidence suggest that people not only lived in New England 10,000 or so years ago but that they were sufficiently advanced to build ocean-going vessels that navigated Atlantic waters for hundreds of miles.

Just as the Brits celebrate their distant past in myth (King Arthur tales; Lord of the Rings; even the Harry Potter series), we may someday have enough information to give future fiction writers, playwrights, and poets the raw material to create our own ancient North American mythology.

There's good reason for us to identify with these peoples. Our Puritan and Yankee models gave us a good foundation for technology, a strong economic system, and moral values, but they were anti-environment. Going green seems to be the only way to save the planet for the next millennium. To get there we have to change our attitude. We need a civil union between our Puritan-Yankee-immigrant heritage and the more environmentally friendly aboriginal way of living in the natural world.

One of the people in the forefront of this moment is documentary filmmaker Theodore Timreck, who has been tracking the archeologists, antiquarians, and native storytellers of New England and Canada for two decades.



PETER ARKLE ILLUSTRATION

As Timreck sees it, the most valuable outcome of the archeological digs and what future finds will do for us is to help make us all Indians again, because, "I've never met anyone who had any sympathetic sense of either Native history or especially Native spiritual traditions who was not environmentally conscious in contemporary terms. So offering a fantastical archeological story about Indians is a slightly different approach to focusing people back on concern for the environment in general and the surprises in their own backyards in particular."

Timreck and other visionaries see a day when native historical sites are preserved and towns make vacation dollars by promoting tours of these sites, part of a strategy to persuade a region to go green.

Ernest Hebert, a guest columnist, is a professor of English at Dartmouth College and the author of 10 books.

A wake-up call for science education

By Alan I. Leshner

PRESIDENT-ELECT Barack Obama has named Harvard and Woods Hole physicist John P. Holdren to serve as assistant to the president for science and technology and director of the White House Office of Science and Technology Policy. Three other renowned scientists — Jane Lubchenco, Eric Lander, and Harold Varmus — also were tapped by Obama to fill key roles.

Holdren's appointment, announced weeks before the inauguration, took place earlier than that of any other science adviser in modern times. Even so, the reinvigoration of US science advice cannot happen soon enough.

The latest alarm bell just rang and it's official. The United States is once again missing from the list of top-10 science and math education countries. A new Trends in International Mathematics and Science Study confirmed that America lags behind many other industrialized countries at the task of preparing tomorrow's labor force. Long-term economic growth depends on a fully competent talent pool, including workers who can excel in a technology-based economy. But young people in many less-developed countries now outperform their American counterparts in both science and math.

Interestingly, eighth-graders in Massachusetts actually tied for first place worldwide in science, while the state's fourth-graders ranked second among nearly 60 other nations. Clearly, the United States is capable of sustaining high-quality K-12 science and math programs. We simply are not providing equal educational opportunities for all of America's children. Now is the time to tackle the science education problem if we want long-term, stable improvements in our national economy and quality of life.

We learned about US students' stagnant science scores while also, not coincidentally, confronting the largest number of job losses since 1945.

Science and technology have been powerful engines of prosperity since World War II, but, sadly, science education and the versatility of the American workforce are both in decline. In 2006, the respected Programme for International Student Assessment reported that 15-year-olds in the United States ranked 17th on science tests and 24th on math tests, compared with teens from 29 other wealthy nations. The United States is failing to address the problems of science education for tomorrow's workforce.

The problem demands a multifaceted response. Competitive pay for teachers should be our top priority. If we want to recruit and retain the best teachers, we need to reward them. Obama has proposed providing scholarships for those who teach in schools with the greatest needs, while training thousands of science and math teachers and boosting early-childhood education. He also has said he wants to help "ensure that state assessments measure higher-order thinking skills."

Such plans demonstrate a commendable vision. We hope that US policymakers, guided by Holdren and colleagues, also can find a way to send a clear signal that science generally and science education specifically are highly valued, respected, and essential for all children, not just those in magnet schools or in Massachusetts. That means increasing funding for science education at all levels, as well as federal research and development more broadly. Federal research and development has declined, in real terms, for the past four years.

Uniform national science-learning standards will be critical, too. Currently, students' science-learning goals vary from state to state, and thus a child who excels in one region may fail elsewhere. This disparity across the country can create unacceptable inequalities in the opportunities provided to the next generation of Americans.

Sputnik, the world's first satellite, ignited America's will to win the innovation race with the Soviet Union. Congress and President Dwight Eisenhower responded in 1957 by quadrupling funds for the National Science Foundation and launching the National Aeronautics and Space Administration. That decision triggered decades of breathtaking achievements, from the first man on the moon to the information superhighway and the decoding of life's genetic blueprint — the human genome.

Today's economic crisis should similarly ignite America's will to ensure that our children's future is at least as good as our own. New jobs and prosperity require investment in science, technology, and science education now.

Alan I. Leshner is chief executive officer of the American Association for the Advancement of Science and executive publisher of the journal Science.

JAMES CARROLL

'What if' questions of Gaza war

AS THE CRIMINAL march of Hamas rocket fire continues across the territory of Israel, the rockets' red glare casts a new light on Israel's and the world's dangerous nuclear complacency. Rockets have fallen, to the north of Gaza, within about 20 miles of Tel Aviv. But even more threatening, they have fallen, to the east, within about 20 miles of Dimona, Israel's ultra-secret nuclear facility in the Negev desert. Although Israel neither confirms nor denies its possession of a nuclear arsenal, it is clear that, since the 1960s, a plutonium production reactor has been operating at Dimona, and is believed to have created enough material for up to 200 nuclear weapons, which have been manufactured in an adjacent underground facility. What would happen if Hamas rockets rained down on such a place?

That this question can even be asked points to yet another drastic consequence of Israel's misbegotten war against Gaza. The range of the rocket fire has increased over the weeks, and Hamas threatens to have longer-range rockets, and no doubt aims to acquire a more deadly arsenal like Hezbollah's in Lebanon. Dimona is protected with sophisticated air and missile defenses, and is mostly a hardened target. Yet the very presence of the nuclear weapons facility in the war zone defines the danger.

While it is not inconceivable that even such primitive weapons as Hamas musters could damage the dome of the Dimona reactor to cause a widely fatal radiation leak, the larger point is that when Israel engages in high-stakes military operations against its enemies, it is a grand illusion to think that Israel's own nuclear reservation won't eventually be targeted, with a massive escalation of psychological and political tensions. Israel's nuclear arsenal is a taboo subject, not to be spoken of, yet Israel's own war now forces the question.

Once, the Israeli bomb might have provided a deterrent, giving heavily armed Arab nations in the region reason to limit their war aims. (The suspected existence of an Israeli bomb did not deter Egyptian and Syrian attacks in 1973.) Israel, in a fight for survival, was seen to have cause for exempting itself from the nuclear nonproliferation regime. But that changed after peace treaties with Egypt and Jordan, and Arab League acceptance of Israel, when security came from agreement, not threat. Israel would surely justify its nuclear readiness now as a deterrent against Iran, whose leaders swear to exterminate the Jewish state, and, perhaps, Syria, which apparently was engaged in a secret nuclear program of its own. Yet Israel's possession of the bomb adds to the pressures that drive Tehran's nuclear ambition.

America's axis-of-evil belligerence also surely strengthens nuclear hardliners within Iran, but with a new administration that dynamic will now perhaps be muted, and even changed.

Will Israel's security continue to be enhanced by a nuclear arsenal that, more than deterring, gives enemies both motive and excuse to pursue their own? Convincing Tehran to limit its nuclear appetite requires every nuclear power, beginning with the United States, to recommit itself to nuclear abolition. What applies to one nation applies to all. That means Israel, too.

In addition to generating Israel's deterrent, Dimona generates radioactive pressure toward the proliferation of nuclear weapons throughout the region, what experts warn of as a "cascade" that, once flowing, would run from Iran to Saudi Arabia to Egypt to Turkey and perhaps to others. And how, if that unfolds, is Israel made safer?

But rockets approaching Dimona raise another question. The inhumanity of Israel's disproportionate assault against the civilian population of Gaza is one thing, but yet another is the historic irresponsibility of attempting to resolve such a dispute through massive military force in the nuclear age. The presence of nuclear weapons in Dimona, and in US, Russian, British, French, Chinese, Indian, Pakistani, and perhaps North Korean arsenals now overshadows every war.

Limited wars inexorably push against limits. Limited wars are a lie. This new condition requires that political leaders move away from war as an instrument of national policy. What Israel is doing in Gaza as a response to Hamas is sending dangerous ripples across the region and beyond. The way to stop this madness is to stop it.

James Carroll's column appears regularly in the Globe.